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UNITED STATES DEPARTMENT OF AGRICULTURE



Influence of Lime and Fertilizers on Pasture Establishment and Production at Jeanerette, La., 1932 to 1938¹

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INTRODUCTION

Presented in this circular are the results of an experiment in the improvement of pastures by the use of lime and chemical fertilizers and by seeding, conducted on the United States Iberia Livestock Experiment Farm, near Jeanerette, La., during the 1932-38 grazing seasons. Because of the demand for increased production of livestock and livestock products and the serious curtailment of farm labor the publication of these data now is particularly timely.

These results should be applicable within the Gulf coast region, particularly on heavier and darker soils, such as those of the Iberia and closely related series. These soils occur in an area extending inland 50 to 100 miles and westward from the Mississippi River into southeastern Texas. They vary from the lighter, brown soils along

¹ Cooperative investigations of the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Animal Husbandry and Animal Nutrition Divisions, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture; and the Louisiana Agricultural Experiment Station up to July 1, 1937.

² The experiments were under the direction of H. N. Vinall (deceased), senior agronomist, and M. A. Hein, senior agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering; W. H. Black, senior animal husbandman, Animal Husbandry Division, and Paul E. Howe, chief of the Animal Nutrition Division, Bureau of Animal Industry. Acknowledgment is made to W. R. Dodson, former superintendent of the Iberia Livestock Experiment Farm, Jeanerette, La.; J. B. Thompson, formerly agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering; and C. W. Edwards (deceased), associate animal husbandman, Animal Husbandry Division, Bureau of Animal Industry, for their immediate supervision of the experiments during the early stages of the studies.

the streams to heavier, black soils near the swampy areas. The black soils usually make the best pasture land. The region is less than 50 feet, and most of it less than 20 feet, above sea level. The average annual rainfall is between 50 and 60 inches. The average frost-free period is 261 days.

The experiment was conducted upon a black to gray coastal prairie soil that had flat topography and a yellow to mottled-gray impervious subsoil, known as Iberia silty clay loam and Iberia clay loam (see fig. 3 on pages 10 and 11).

The objects of the experiment were to compare the influence on the production value of certain pasture plants of (1) light applications of superphosphate, (2) heavy applications of superphosphate, (3) superphosphate and nitrate of soda, (4) superphosphate, nitrate of soda, and muriate of potash, (5) ground oystershell alone and in combination with these other fertilizers, and (6) basic slag. This influence was measured in (a) yield and botanical composition of the pasturage, and (b) pounds of steer gain.

PLAN OF THE EXPERIMENT

The area used had been a rice field for several years prior to 1931 but was not cultivated that season. As a result, native weeds, briars, and grasses covered it with a rank growth, in some places reaching a height of 10 to 12 feet. The field was cleared in the fall of 1931, and nine 6-acre pastures were laid out and fenced. The pastures were rectangular, being six times as long as they were wide. Each pasture was graded and ditched to insure good drainage, then fertilized and seeded. The plans of fertilization and the cost of the fertilizers are given in tables 1 and 2. The original seeding plan of 1931-32 and the later reseedings are given in table 3. The average monthly rainfall for the years 1918-38, as compared with the monthly rainfall for 1933-38, is given in figure 1.

TABLE 1.—*Rate of application of lime and fertilizer¹ per acre on the pastures for the grazing seasons 1932-38*

Pasture	Fertilizer	Rate of application						
		1932	1933	1934	1935	1936	1937	1938
1	Superphosphate	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	
1	Superphosphate	200	200	200	200	200		
2	Ground oystershell	200	200	200	200	200		
2	Ground oystershell	4,000						
3	Superphosphate	400	400	400	400	400		
3	Ground oystershell	4,000						
4	Superphosphate	400	400	400	400	400		
4	Ground oystershell	4,000						
5	Nitrate of soda	240	200	200	200	200	100	100
5	Ground oystershell	4,000						
6	Superphosphate	400	400	400	400	400		
6	Ground oystershell	4,000						
6	Nitrate of soda	240	200	200	200	200	100	200
7	Muriate of potash	75	75	75	75	75		
7	Superphosphate	200	200		200			
8	Ground oystershell	4,000						
9	Basic slag	400						

¹ The analyses of the lime and fertilizers were as follows: Superphosphate—18 percent P₂O₅; nitrate of soda—equivalent to nitrogen 15 percent; muriate of potash—equivalent to K₂O 48 to 50 percent; basic slag—10 percent P₂O₅ and 40 percent CaO; ground oystershell—CaCO₃ 98 percent (ground so that 75 percent passed through a 200-mesh sieve and 100 percent through a 60-mesh sieve).

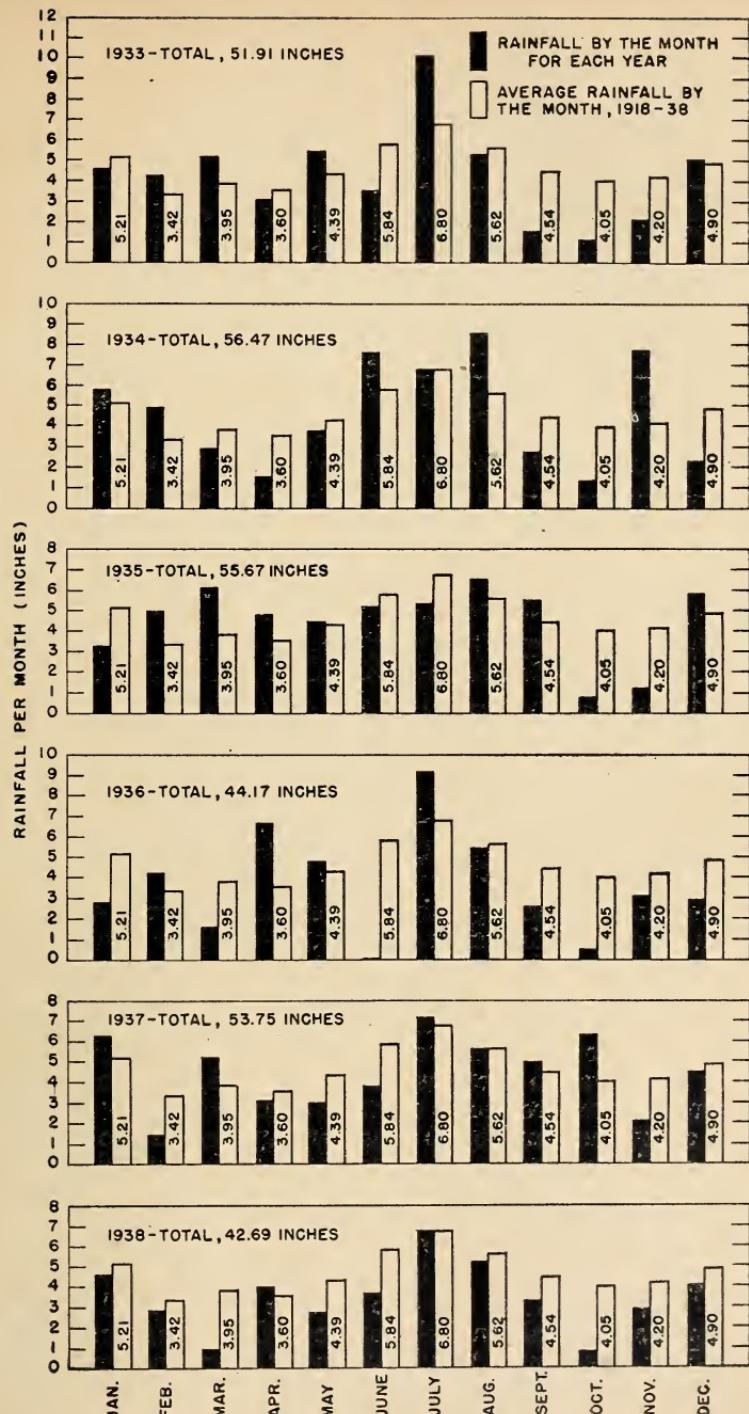


FIGURE 1.—Rainfall at Jeanerette, La., in inches per month for each of the years 1933-38 and the average for the years 1918-38.

TABLE 2.—*Lime and fertilizer costs per acre, including the purchase price, transportation charges, and expenses of distribution in the pastures*

Pasture	Fertilizer costs per acre ¹							Average, 1932-38
	1932	1933	1934	1935	1936	1937	1938	
1	\$2.01	\$1.99	\$2.42	\$2.30	\$2.30	\$1.03	\$1.03	\$1.57
2	3.04	3.02	3.45	3.33	3.33	1.03	1.03	2.60
3	5.05	4.98	5.86	5.63	5.63	1.03	1.03	4.17
4	11.59	8.70	10.31	10.03	9.52	2.93	3.28	8.05
5	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
6	13.41	10.55	12.36	11.60	11.10	2.93	5.53	9.64
7	2.01	1.99	—	2.30	—	—	—	.90
8	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
9	.36	.36	.36	.36	.36	.36	.36	.36

¹ The cost of the ground oystershell and basic slag was prorated over an 8-year period; that of the other fertilizers is given as it was incurred each year.

TABLE 3.—*Rates and dates of the seedings in the pastures*

Pasture	Grass or legume		Rate per acre	Date
	Pounds			
1 to 6	White clover, <i>Trifolium repens</i> L.	15	1931	Oct.
	Lespedeza (common), <i>Lespedeza striata</i> (Thunb.) Hook. and Arn.	15	1932	
	Dallis grass, <i>Paspalum dilatatum</i> Poir.	6	Do.	
7	Alyce clover, <i>Alysicarpus vaginalis</i> (L.) DC.	6	Mar.	
	Persian clover, <i>Trifolium resupinatum</i> L.	15	1931	Oct.
8	Common lespedeza	15	1932	Feb.
	Dallis grass	6	Do.	
9	White sweetclover, <i>Melilotus alba</i> (L.) Desr.	25	1931	Oct.

¹ White clover was resown at the rate of 6 pounds per acre in pastures 1 to 6, and Persian clover (with approximately a 30-percent mixture of white clover) at 8 pounds per acre in pasture 8 in November 1933.

At the beginning of each grazing season the number of experimental animals allotted to each pasture was based on their size and weight and on the condition of the pasture. If, at the end of each 28-day-weight period, the amount of forage on the separate pastures appeared sufficient to carry additional animals, one or more was added; if short, one or more was removed and either transferred to another pasture or held over in a reserve pasture. This system of management is generally referred to as controlled grazing.

Ground oystershell and basic slag were applied in the fall of 1931 and were considered to be effective for a period of eight grazing seasons. Potash and superphosphate were applied, as indicated, annually in the spring (February or March) for the 1932 and 1933 grazing seasons and in the fall of the previous year for the 1934, 1935, and 1936 grazing seasons. Neither superphosphate nor potash was applied in 1937 and 1938. Nitrate of soda was applied annually in two treatments, one half in February or March and the other half in June or July, to pastures 4 and 6 through the grazing season of 1936. The spring (February or March) application was omitted in 1937. It was also omitted on pasture 4 in the spring of 1938 but was applied to pasture 6 for the purpose of comparing the two rates of treatment.

PLANT POPULATION STUDIES

In April 1933, prior to the initiation of the grazing for that season, a survey was made with the object of recording the general condition and flora of each pasture.

White clover and Vasey grass (*Paspalum urvillei* Steud.) were the principal constituents. The clover, ranging from 2 to 6 inches high, was in full bloom with many well-developed but immature seed heads. The Vasey grass was 8 to 12 inches high, principally leaf blades with very few heads showing at the time.

Canary grass (*Phalaris caroliniana* Walt. and *P. angusta* Nees) was plentiful and was maturing rapidly. The Bermuda grass (*Cynodon dactylon*), Dallis grass, and common lespedeza were not very thick and were hidden by the taller grasses and white clover. The predominant weeds were *Rumex* sp., *Ambrosia* sp., *Senecio* sp., *Cirsium horridulum* Michx., and *Sesbania macrocarpa* Muhl.

The percentages of ground cover furnished by the different grasses, legumes, and weeds were determined by careful estimates on from 10 to 20 small but representative areas in each pasture. Table 4 gives the average percentage of ground cover for the seasons of 1933-38.

TABLE 4.—Percentages of ground cover furnished by the different grasses and legumes in the years 1933-38

Date and type of ground cover	Proportion furnished in pastures—								
	1	2	3	4	5	6	7	8	9
April 11: ¹									
Vasey grass	50	40	42	45	50	45	55	80	
White clover	35	50	48	45	40	45	35		
Persian clover								3	
White sweetclover									2
Miscellaneous grasses and weeds	15	10	10	10	10	10	7	18	
August 22:									
Bermuda grass	28	47	36	54	43	43	8	48	21
Vasey grass	53	39	48	39	45	50	40	36	70
Lespedeza (common)	6	2	1		1				1
White Dutch clover	5	7	5		5	1	1	12	
Alyce clover								28	
Crabgrass								12	
Miscellaneous grasses	5		3		5	2	7	3	4
Miscellaneous weeds	3	5	7	7	1	4	4	1	4
October 7: ²									
Bermuda grass	40	52	47	62	47	68	2	73	43
Vasey grass	54	36	46	32	48	24	45	19	54
Lespedeza (common)								3	
White Dutch clover	1							2	
Alyce clover								29	
Crabgrass								14	
Miscellaneous grasses	3	5	3	3	4	5	6	3	2
Miscellaneous weeds	2	7	4	3	1	3	4		1
May 4: ³									
Vasey grass	22	4	14	7	13	6		2	62
White Dutch clover	31	32	35	24	38	29		59	2
Bermuda grass	22	32	28	36	33	42		23	31
Persian clover								7	
Canary grass	19	27	18	30	10	20			
Dallis grass		1	2			1			
Miscellaneous grasses and weeds	6	4	3	3	6	2		2	5
September 9:									
Vasey grass	29	11	15	9	15	2		2	50
White Dutch clover	3	3	2						
Bermuda grass	28	59	53	70	56	78		78	32
Dallis grass	18	10	17	10	18	16		10	5
Lespedeza (common)	12	4	1		1				1
Miscellaneous grasses and weeds	10	13	12	11	10	4		10	12

¹ No observations were made in pasture 7 on Apr. 11, 1933.

² In pasture 7 these data were taken Sept. 26, 1933.

³ Pasture 7 was not grazed in 1934. It was mowed for weed control. No population counts were made.

TABLE 4—Percentages of ground cover furnished by the different grasses and legumes in the years 1933-38—Continued

Date and type of ground cover	Proportion furnished in pastures—								
	1	2	3	4	5	6	7	8	9
1935	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
April 2:									
Vasey grass	28	24	28	20	16	4	52	4	52
Dallis grass	8	12	12	12	12	8	4	4	8
Bermuda grass	12	8	4	8	8	4	6	4	12
Canary grass ⁴	20	16	22	20	24	20	14	8	14
White Dutch clover	20	32	28	34	24	56	12	76	8
Miscellaneous grasses and weeds	12	8	6	6	16	8	12	4	6
September 20:									
Vasey grass	35	9	14	3	15	2	20	2	34
Dallis grass	24	10	16	6	14	8	12	8	
Bermuda grass	27	75	66	83	62	88	67	81	52
Alyce clover							10		
Lespedeza (common)	13	2					1		2
Miscellaneous grasses and weeds	1	4	4	8	9	2	2	5	4
1936 ⁵									
May 8:									
Vasey grass	35	7	8	5	14	8		4	35
Dallis grass	3	4	4	4	5	7		3	
Bermuda grass	4	23	20	33	18	16		38	24
Canary grass	2	5	5	6	2	4		4	
Lespedeza (common)									1
White Dutch clover	51	57	62	48	60	64		50	34
Hop clover	2								
Miscellaneous grasses and weeds	3	4	1	4	1	1		1	6
October 15:									
Vasey grass	20	12	8	8	16	4		12	38
Dallis grass	24	20	16	12	24	24		20	12
Bermuda grass	44	62	72	76	56	68		60	34
Carpet grass (<i>Axonopus affinis</i> Chase)			2					2	4
Lespedeza (common)	10	4						4	8
White Dutch clover			2	3	4	2			
Miscellaneous grasses and weeds	2	2		1		2		2	4
1937									
April 10:									
Bermuda grass	16	20	20	16	20	4	20	16	16
Canary grass	8	24	20	16	20	12	16	20	
Dallis grass	16	16	16	16	12	16	4	8	8
Vasey grass	20	16	4	4	8	4			20
Hop clover ⁶	16								16
White clover	24	20	36	40	40	64	60	56	40
Native vetch ⁷			4	4					
Miscellaneous weeds			4		4				
June 16:									
Bermuda grass	36	52	32	40	36	36	32	48	24
Dallis grass	20	24	32	28	20	20	8	24	20
Vasey grass	28	12	12	16	20	8	8	16	32
Lespedeza (common)							4		
White clover	16	12	24	16	24	36	48	12	24
July 8:									
Bermuda grass	40	48	52	48	44	60	52	56	44
Dallis grass	24	36	32	32	32	28	8	24	16
Vasey grass	36	12	12	20	20	8	8	12	24
Crabgrass							4		
Lespedeza (common)							12	4	8
White clover			4	4		4	16	4	4
Miscellaneous weeds									4
October 14:									
Bermuda grass	44	60	72	68	68	72	40	72	56
Dallis grass	24	28	28	32	24	28		28	16
Vasey grass	28	12			8		60		16
Crabgrass									
Lespedeza (common)		4							8
Miscellaneous weeds									4

⁴ Principally *Phalaris caroliniana*.⁵ Pasture 7 was reworked and seeded to common lespedeza in March 1935. The lespedeza failed and no population counts were made.⁶ Principally *Trifolium dubium* Sibth.⁷ *Vicia ludoviciana* Nutt.

TABLE 4.—*Percentages of ground cover furnished by the different grasses and legumes in the years 1933–38—Continued*

Date and type of ground cover	Proportion furnished in pastures—								
	1	2	3	4	5	6	7	8	9
March 21: 1938	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Vasey grass.....	12	20	12	12	4	4	4	4	8
Dallis grass.....	8	20	12	8	8	12	4	20	8
Bermuda grass.....	4	8	4	24	4	4	8	—	4
Canary grass.....	8	20	36	40	16	36	24	20	12
White clover.....	52	28	32	8	64	40	60	56	56
Hop clover.....	12	—	—	—	—	—	—	—	12
Miscellaneous weeds.....	4	4	4	8	4	4	4	4	—
July 13:									
Vasey grass.....	11	4	7	—	1	—	8	—	15
Dallis grass.....	22	16	31	15	33	17	1	25	10
Bermuda grass.....	64	75	58	85	62	82	76	75	71
Carpet grass.....	2	5	2	—	2	—	—	—	2
Crabgrass.....	—	—	—	—	—	—	10	—	—
White clover.....	1	—	2	—	2	1	3	—	2
Miscellaneous weeds.....	—	—	—	—	—	—	2	—	—
October 5:									
Vasey grass.....	20	4	2	—	2	—	8	—	14
Dallis grass.....	28	30	30	24	30	20	8	24	16
Bermuda grass.....	48	60	68	72	66	70	72	76	60
Carpet grass.....	2	6	—	—	2	—	8	—	2
Crabgrass.....	—	—	—	—	—	—	—	—	—
Lespedeza (common).....	2	—	—	—	4	—	4	—	6
Miscellaneous weeds.....	—	—	—	—	—	—	—	—	2

In March and early April 1934 there was an abundance of lush pasturage, principally canary grass, white clover, and some Vasey grass. The quantity was overestimated and the pastures overstocked, which resulted in too close grazing. This, in addition to the dry weather and intermittent cool periods in late April and May, greatly retarded the later spring growth. Consequently, in June the pastures were in poor condition. Vasey grass and weeds were abundant, and the Bermuda grass was slow in replacing the rapidly disappearing white clover. The later growth and spread of the Bermuda grass and Dallis grass supplied a more nutritious pasturage for fall grazing.

During 1933 and 1934 the stand and growth of the weeds, principally ragweeds, thistles, and dock, were greater in proportion to the other forage in the extreme south one-sixth of each pasture than elsewhere. This was due to a difference in the cultural practices in this southern strip and in the remainder of the pastures before the project was begun. By the spring of 1935 the flora and growth within each pasture were fairly uniform. Later in the season, the growth in the north part appeared to be rank and less abundant than that in the remainder of the pasture. This probably was due to the fact that the salt, water, and sheds for shade were in the north end, thus inducing the cattle to gather there often and remain during the greater part of the midsummer days. As the droppings increased, the proportion of palatable grazing decreased and the cattle drifted toward the south end as they grazed. This, of course, magnified the contrast between the closely grazed clovers and grasses of the south end and the rank growth of weeds in the north end.

In 1935, in addition to the observations, made as in previous years, a quadrat divided into 25 2-inch squares was cast from 10 to 25 times

in each pasture, and these data were averaged in calculating the relative percentages of the ground cover per pasture.

A direct comparison cannot be made of the data obtained in the springs of 1934-1935 because of the fact that the observations were made some 30 days later in 1934 than in 1935. Also in 1934 the pastures were clipped with a mower about 15 days before the counts were made. It may be noted in general, however, that in April 1935 the Vasey grass appeared to be thicker and that the Dallis grass and canary grass had also made noticeable gains since May 1934. The white clover and Bermuda grass were not so advanced at the time of the 1935 spring counts as in 1934.

A more accurate comparison may be made of the two fall observations. The Vasey grass was more abundant in pasture 1 in 1935 than in 1934 (fig. 2, A). In all other pastures it was about the same as in 1934. The Dallis grass and the Bermuda grass had increased in a percentage about comparable with the decrease of the Vasey grass.



FIGURE 2.—A, Type and condition of steers and pasture 1 on September 24, 1935;
B, type and condition of steers and pasture 4 on September 24, 1935.

On March 4, 1936, the pasturage, in general, was short. The stand of white clover was fairly uniform, but it had made a slow growth. The dead growth of Bermuda, Vasey, and Dallis grasses had retarded the emergence and early growth of these grasses and shaded to a great degree the young clover.

By early May the pastures had made a good growth, with the white clover predominating, yet thin enough for the Bermuda grass to be coming in more rapidly than in previous years. As a result of the early clippings, the Vasey grass was less abundant and appeared to be fairly palatable. The Dallis grass was also spreading and growing. The rank of the pastures according to the quantity and quality of the pasturage was the same as on April 10.

In October the pastures were in poor condition. The growth for the previous 30 days had been slow and the grazing patchy. With the exception of a few scattered bunches of clover coming from old crowns, only the Dallis grass was green. The Bermuda grass was in the advanced stage of maturity.

The general condition of the pastures throughout 1937 was very satisfactory. The total production was not equal to that of some of the previous years; however, at no time was there a shortage of forage. The stand of white clover was thin, and it made a slow, early growth. However, it was supplemented in early spring with Dallis grass and canary grass and in late spring and summer with Dallis grass, Vasey grass, and Bermuda grass.

Normally, when there is an abundant or rank growth of white clover, the grasses, principally Bermuda and Dallis, are practically smothered out until the clover matures and disappears. This disappearance of the clover usually occurs with such rapidity between May 15 and June 30, depending upon the season, that the grasses cannot replace it quickly enough to prevent a decrease and sometimes scarcity of forage at that time. With 2 to 4 weeks, however, if there is sufficient rainfall, this condition is relieved. A shortage of forage did not occur at this time in 1937, since the normal spring growth of the well-established grasses rapidly replaced the clover.

Throughout July to October there was more forage than was needed for the cattle, except in pasture 8, where an effort was purposely made to overgraze.

In the early spring of 1938 the flora of the pastures, except No. 4, consisted principally of white clover, Dallis grass, and canary grass. Their general condition was good. The stand of clover was well distributed and not so thick as to completely crowd out the grasses. The height was uniformly from 6 to 10 inches. The flora of pasture 4 was almost wholly canary grass and Bermuda grass. In May 1936 and April 1937 the stand of clover was 48 and 40 percent, respectively. In March and May 1938, it was 8 and 5 percent, respectively. The only modification of the past cultural practices was the elimination of the annual application of fertilizers to all pastures. The grazing practices remained the same; yet this radical change in flora occurred, the cause of which has not been determined.

Throughout the summer and fall, Bermuda grass and Dallis grass, with relatively few weeds, completely covered all the pastures.

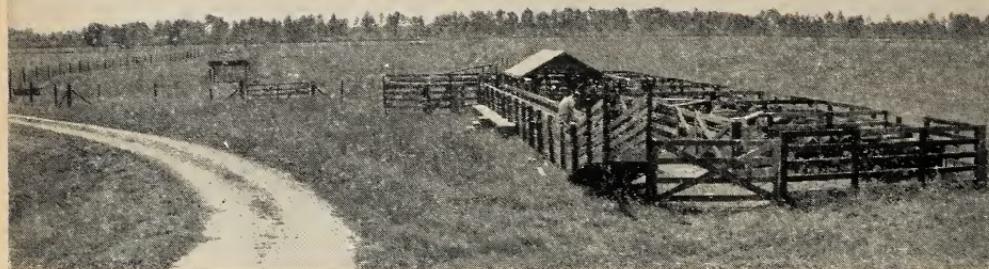


FIGURE 3.—General view of the pa

HERBAGE STUDIES METHODS

As a means of measuring the pasturage produced, two open-mesh wire cages, measuring 4 feet square and 18 inches high, were placed on representative areas in both the north and south halves of each pasture. These cages were used in pairs for the purpose of obtaining the yields from (1) an area that was left uncut, and (2) an area that was cut at the time the cages were set. Green yields were taken in both ends of each pasture. The weights averaged and converted to an acre basis represent the production of the pastures. Each pair of cages was managed as follows:

One area was left uncut and a cage designated as A was placed over it. On the other area, the forage was cut and a cage designated as B was set over it. The growth underneath both A and B cages was cut 28 days later, the cages were moved to a new location, and the process repeated. The clippings in each case were given the same designation as that of the cage covering that area for the period. In each instance the clippings from the A cage, less that cut from the newly selected area for the B cage for the succeeding 28-day period, were taken to represent the amount of pasture growth consumed by the grazing animals during that period. The clippings from the B cage were taken to represent the pasture growth on the cut area by periods of harvest.

YIELDS

Herbage yields were not obtained in 1933.

The green samples taken for the seasons 1934-38 in the manner just described were first dried at a temperature of 65° to 70° C. in an oil-heated oven for 2 to 4 days, or until they appeared to be as dry as sun-cured hay, and then in an electric oven at a temperature of 90° to 110° C. for at least 72 hours. The green and oven-dry weights were converted to an acre basis and are given in table 5.



last year of the grazing experiment.

The production of dry forage (A cages) was good in 1934 and higher in 1935, indicating an improvement in the pasturage. The production in 1936 was lower than that of 1935, and this decrease was probably due to the subnormal total precipitation of 31 inches, March to October, inclusive, compared with an 18-year average of 40 inches for the period. However, by good management, the steer gains per acre were maintained at a level comparable with that of previous years. Because of an epizootic of keratitis among the steers the pastures were not grazed heavily in 1937, and, as a result of a normal season, the forage production was about equal to that of 1936. The general trend of decreased production commencing after the peak year of 1935 was continued through 1938.

In response to the complete fertilizer treatment, pasture 6 averaged the best forage yield. Pasture 9 had the lowest 5-year average, but the continued increase in the steer gains from 138 pounds per acre in 1934 to 312 pounds in 1938 indicates that the quality of the forage was improving. In 1933 the forage in pasture 9 was 100 percent Vasey grass, but the regular mowing each year and the continuous close grazing practically eliminated the Vasey grass, and in 1938 the pasturage was comparable in flora with that of the other pastures. The average production of the other pastures (B cages) for the years 1934-38 ranged between that of No. 9, 3,500 pounds, and No. 6, 7,700 pounds per acre.

In table 6 the oven-dried yields for both the A and B cages are presented. These cage yields are averaged for all the pastures for each year and for each pasture for the years that the data were obtained. The average yield per acre as calculated by these two methods of measurement compares very favorably for the seasons 1934, 1935, and 1938, but differs greatly in 1936 and 1937. No plausible explanation for these differences can be offered at this time.

The production of the A cage for the seasons 1935-38 is also represented in figures 4 and 5.



FIGURE 3.—General view of the pastures the last year of the grazing experiment.

HERBAGE STUDIES

METHODS

As a means of measuring the pasturage produced, two open-mesh wire cages, measuring 4 feet square and 18 inches high, were placed on representative areas in both the north and south halves of each pasture. These cages were used in pairs for the purpose of obtaining the yields from (1) an area that was left uncut, and (2) an area that was cut at the time the cages were set. Green yields were taken in both ends of each pasture. The weights averaged and converted to an acre basis represent the production of the pastures. Each pair of cages was managed as follows:

One area was left uncut and a cage designated as A was placed over it. On the other area, the forage was cut and a cage designated as B was set over it. The growth underneath both A and B cages was cut 28 days later, the cages were moved to a new location, and the process repeated. The clippings in each case were given the same designation as that of the cage covering that area for the period. In each instance the clippings from the A cage, less that cut from the newly selected area for the B cage for the succeeding 28-day period, were taken to represent the amount of pasture growth consumed by the grazing animals during that period. The clippings from the B cage were taken to represent the pasture growth on the cut area by periods of harvest.

YIELDS

Herbage yields were not obtained in 1933.

The green samples taken for the seasons 1934-38 in the manner just described were first dried at a temperature of 65° to 70° C. in an oil-heated oven for 2 to 4 days, or until they appeared to be as dry as sun-cured hay, and then in an electric oven at a temperature of 90° to 110° C. for at least 72 hours. The green and oven-dry weights were converted to an acre basis and are given in table 5.

The production of dry forage (A cages) was good in 1934 and higher in 1935, indicating an improvement in the pasturage. The production in 1936 was lower than that of 1935, and this decrease was probably due to the subnormal total precipitation of 31 inches, March to October, inclusive, compared with an 18-year average of 40 inches for the period. However, by good management, the steer gains per acre were maintained at a level comparable with that of previous years. Because of an epizootic of keratitis among the steers the pastures were not grazed heavily in 1937, and, as a result of a normal season, the forage production was about equal to that of 1936. The general trend of decreased production commencing after the peak year of 1935 was continued through 1938.

In response to the complete fertilizer treatment, pasture 6 averaged the best forage yield. Pasture 9 had the lowest 5-year average, but the continued increase in the steer gains from 138 pounds per acre in 1934 to 312 pounds in 1938 indicates that the quality of the forage was improving. In 1933 the forage in pasture 9 was 100 percent Vasey grass, but the regular mowing each year and the continuous close grazing practically eliminated the Vasey grass, and in 1938 the pasturage was comparable in flora with that of the other pastures. The average production of the other pastures (B cages) for the years 1934-38 ranged between that of No. 9, 3,500 pounds, and No. 6, 7,700 pounds per acre.

In table 6 the oven-dried yields for both the A and B cages are presented. These cage yields are averaged for all the pastures for each year and for each pasture for the years that the data were obtained. The average yield per acre as calculated by these two methods of measurement compares very favorably for the seasons 1934, 1935, and 1938, but differs greatly in 1936 and 1937. No plausible explanation for these differences can be offered at this time.

The production of the A cage for the seasons 1935-38 is also represented in figures 4 and 5.

TABLE 5.—*Green and oven-dried forage yields per acre and the percentage of dry matter, as measured by the A and B cages, for the seasons 1934–38*

1934 (FIRST CLIPPING, MAY 16; LAST CLIPPING, OCT. 22)

Pasture ¹	Treatment ²	A			B		
		Green	Oven-dry	Dry matter	Green	Oven-dry	Dry matter
		<i>Pounds</i>	<i>Pounds</i>	<i>Percent</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Percent</i>
1.	P	25,391	6,081	23.95	25,811	5,631	21.82
2.	LP	21,743	5,546	25.51	29,129	7,969	27.36
3.	LP	33,600	7,518	22.38	38,071	8,520	22.38
4.	LNP	28,303	6,985	24.68	29,574	6,860	23.20
5.	L	23,169	6,008	25.93	29,171	7,121	24.41
6.	LNPK	29,240	7,820	26.74	29,656	7,826	26.39
8.	L	32,188	8,498	26.40	27,689	7,408	26.75
9.	P	(3)	(3)	(3)	14,704	3,453	23.48

1935 (FIRST CLIPPING, MAY 1; LAST CLIPPING, OCT. 21)

1.	P	27,621	7,515	27.21	28,049	8,174	29.14
2.	LP	36,643	10,565	28.83	37,525	10,786	28.74
3.	LP	33,907	9,542	28.14	38,021	10,013	26.34
4.	LNP	38,157	10,212	26.76	41,873	11,340	27.08
5.	L	31,406	8,363	26.63	34,049	8,162	23.97
6.	LNPK	42,685	10,846	25.41	47,557	11,562	21.31
8.	L	37,622	9,589	25.49	38,406	9,607	25.01
9.	P	(3)	(3)	(3)	15,165	4,323	28.51

1936 (FIRST CLIPPING, MAY 13; LAST CLIPPING FOR A, OCT. 14, AND FOR B, SEPT. 30)

1.	P	25,229	8,397	33.28	15,233	3,947	25.91
2.	LP	26,649	8,384	31.46	17,029	4,667	27.41
3.	LP	29,328	9,238	31.50	20,816	5,624	27.02
4.	LNP	29,405	9,812	33.37	23,961	6,610	27.59
5.	L	27,530	8,929	32.43	16,426	4,546	27.68
6.	LNPK	34,868	10,438	29.94	22,148	5,716	25.81
8.	L	25,347	9,056	35.73	12,896	3,388	26.27
9.	P	19,591	6,582	33.60	11,808	3,180	26.93

1937 (FIRST CLIPPING, MAY 6; LAST CLIPPING, OCT. 21)

1.	P	30,259	8,574	28.34	24,276	5,410	22.29
2.	LP	25,482	5,975	23.45	22,542	5,685	25.22
3.	LP	28,802	7,188	24.96	28,317	6,471	22.85
4.	LNP	28,074	6,737	24.00	26,120	6,352	24.32
5.	L	32,870	9,226	28.07	25,351	5,523	21.79
6.	LNPK	25,400	6,600	25.98	42,426	9,066	21.37
7.	P	24,987	7,057	28.24	18,256	4,024	22.04
8.	L	31,339	8,477	27.05	24,150	5,603	23.20
9.	P	34,876	7,942	22.77	16,413	3,852	23.47

1938 (FIRST CLIPPING, APR. 21; LAST CLIPPING FOR A, NOV. 3, AND FOR B, OCT. 6)

1.	P	13,531	3,534	26.12	13,758	3,330	24.20
2.	LP	18,471	4,528	24.51	16,449	4,065	24.71
3.	LP	15,355	3,671	23.91	15,696	4,072	25.94
4.	LNP	10,389	2,736	26.34	14,926	4,105	27.50
5.	L	15,339	4,230	27.58	13,599	3,337	24.54
6.	LNPK	20,699	5,619	27.15	18,805	4,634	24.64
7.	P	13,439	3,909	29.09	18,031	4,168	23.12
8.	L	14,020	3,393	24.20	14,666	3,724	25.39
9.	P	9,430	2,352	24.94	11,648	2,902	24.91

¹ As the Alyce clover in pasture 7 failed and as the pasture did not become definitely established as a unit of the project until the white clover was sown in the fall of 1936, no herbage yields were taken until 1937.

² See table 1.

³ Because of a shortage of cages, the A areas were not harvested in pasture 9 until 1936.

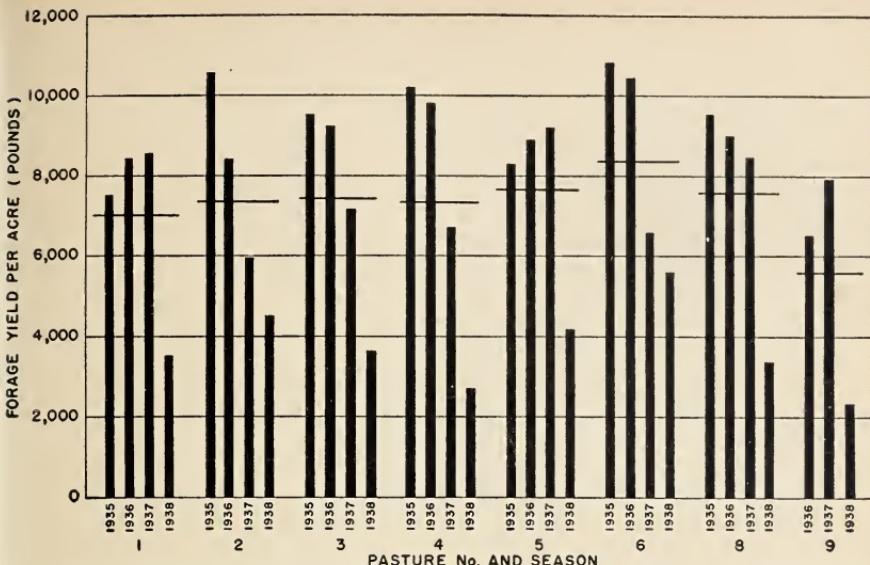


FIGURE 4.—Yields of oven-dried forage (A cage) in pounds per acre for each pasture for the seasons 1935–38. The horizontal lines represent the average yield for these years.

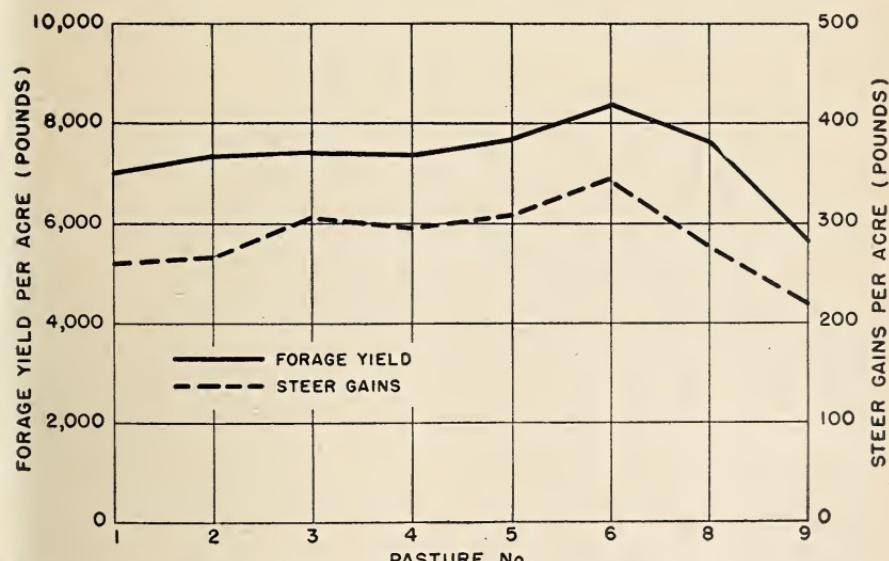


FIGURE 5.—Average yields of oven-dried forage (A cage) and the steer gains in pounds per acre for each pasture for the seasons 1935–38.

TABLE 6.—*Oven-dry yields per acre as measured by the A and B cages for the seasons 1934–38*

Pasture	1934		1935		1936	
	A	B	A	B	A	B
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
1.	6,081	5,631	7,515	8,174	8,397	3,947
2.	5,546	7,969	10,565	10,786	8,384	4,667
3.	7,518	8,520	9,542	10,013	9,238	5,624
4.	6,985	6,860	10,212	11,340	9,812	6,610
5.	6,008	7,121	8,363	8,162	8,929	4,546
6.	7,820	7,826	10,846	11,562	10,438	5,716
7.						
8.	8,498	7,408	9,589	9,607	9,056	3,388
9.		3,453		4,323	6,582	3,180
Average per acre	6,922	6,849	9,519	9,246	8,855	4,710
	1937		1938		Average	
1.	8,574	5,410	3,534	3,330	6,820.2	5,298.4
2.	5,975	5,685	4,528	4,065	6,999.6	6,634.4
3.	7,188	6,471	3,671	4,072	7,431.4	6,940.0
4.	6,737	6,352	2,736	4,105	7,296.4	7,053.4
5.	9,226	5,523	4,230	3,337	7,351.2	5,737.8
6.	6,600	9,066	5,619	4,634	8,264.6	7,760.8
7.	7,057	4,020	3,909	4,168	5,483.0	4,094.0
8.	8,477	5,603	3,393	3,724	7,802.6	5,946.0
9.	7,942	3,852	2,352	2,902	5,625.3	3,542.0
Average per acre	7,531	5,776	3,775	3,815	—	—

GRAZING STUDIES

STEERS USED

Steers of various breeding, grade, and origin were used over the seven grazing seasons 1932–38. For the grazing seasons of 1932 and 1933 steer calves purchased locally were used. They proved unsatisfactory because of a rather heavy infestation of internal parasites. The group purchased in 1932 were so heavily infested that the experiment was discontinued after 3 months. The group of 83 grade Aberdeen Angus locally bred steer calves purchased for the 1933 grazing season were in better condition than the 1932 calves and were maintained until the end of the grazing season. They entered the tests on April 12, 1933, at an average weight of 297 pounds and came off the test September 28 with an average weight of 464 pounds. These 1933 calves were too small to take care of the abundant grazing during the greater part of the season.

Larger and better grade experimental animals, 2- and 3-year-old thin steers, were obtained each spring for the 1934, 1935, and 1936 grazing seasons from the region surrounding Tallulah, in northern Louisiana (fig. 6). They were chiefly grade Shorthorn and Hereford steers, rather thin in flesh, but thrifty and possessing good conformation and type. Average initial and final weights for the steers from this source are given in table 7.

After finishing each grazing season, most of the steers were placed in the dry lot for wintering.

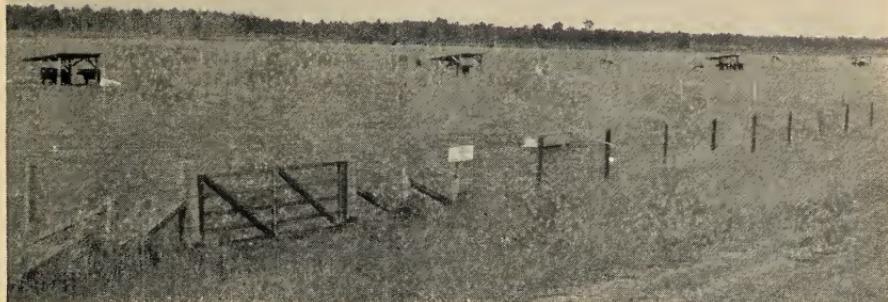


FIGURE 6.—Condition of the pastures September 24, 1935, and the type of sheds used. The steers were chiefly 3-year-old grade Hereford and Shorthorn.

TABLE 7.—*Average initial and final weights of the steers in the experiment for the years 1934-36*

	Year	Initial weight		Final weight	
		Pounds	Pounds	Pounds	Pounds
1934.....		724		1,057	
1935.....		653		970	
1936.....		652		961	

In the spring of 1937 a group of 60 grade Hereford yearling steers, with an average weight of 563 pounds, were purchased on the Fort Worth market and started on the grazing experiment on April 8. They finished the test with an average weight of 773 pounds. This group of steers suffered a setback because of a general outbreak of keratitis during the month of June. To this cause is attributed the lower-than-expected steer gains for the 1937 grazing season.

After the 1937 grazing season, these experimental steers were wintered in the dry lot so as to lose weight, and were again placed in the pasture experiment, in thin condition, in March 1938. At this time they averaged 710 pounds. After finishing the 1938 grazing season they averaged 992 pounds.

STEER GAIN

Table 8 represents the average steer gain in pounds per acre for each period, the total gain per acre for the season, and the average carrying capacity in steers per acre for each pasture for 1933 and 1934.

TABLE 8.—*Average steer gains in pounds per acre for each period, the total for the season, and the average carrying capacity in steers per acre for each pasture for 1933 and 1934*

1933—AVERAGE INITIAL WEIGHT 297 POUNDS; FINAL WEIGHT 464 POUNDS

Pasture	Steer gains per acre							Average carrying capacity (steers per acre)
	Apr. 12 to May 11	May 11 to June 8	June 8 to July 6	July 6 to Aug. 3	Aug. 3 to Aug. 31	Aug. 31 to Sept. 28	Total for the season	
1	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Number
1	72.8	37.5	19.2	26.7	78.3	17.5	252.0	1.83
2	74.0	58.3	36.7	51.7	56.7	33.3	310.7	1.83
3	56.3	45.8	30.0	58.3	23.3	35.0	248.7	1.83
4	67.8	56.7	50.0	60.8	28.3	40.0	303.6	1.83
5	111.7	58.3	16.7	66.7	56.7	13.3	323.4	1.83
6	89.5	52.5	56.7	50.0	48.3	1.7	298.7	1.83
8	100.5	65.0	65.0	45.0	46.7	5.0	327.2	1.83

1934—AVERAGE INITIAL WEIGHT 724 POUNDS; FINAL WEIGHT 1,057 POUNDS

Pasture	Steer gains per acre									Average carrying capacity (steers per acre)
	Apr. 11 to May 9	May 9 to June 6	June 6 to July 4	July 4 to Aug. 1	Aug. 1 to Aug. 29	Aug. 29 to Sept. 26	Sept. 26 to Oct. 24	Oct. 24 to Nov. 7	Total for the season	
1	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Number
1	109.1	33.3	21.6	35.0	25.0	15.0	5.0	10.0	254	0.78
2	222.5	19.1	26.6	33.3	30.0	16.6	36.6	-7.8	377	1.09
3	219.1	4.1	11.6	31.6	45.0	58.3	18.3	-18.0	370	1.05
4	252.3	15.0	10.0	46.6	38.3	48.3	31.6	-7.8	434	1.13
5	247.5	-20.8	46.6	20.0	43.3	38.3	38.3	-9.5	404	1.00
6	305.0	-19.1	5.0	28.3	50.0	41.6	26.6	-4.0	433	1.21
8	221.0	57.5	28.3	15.0	48.3	48.3	-3.3	14.8	430	1.16
9 ¹	46.8	18.3	13.3	3.6	15.0	21.6	10.0	8.9	138	.67

14 acres; all other pastures 6 acres.

Table 9 represents the steer gains and the dry-herbage yield in pounds per acre, together with the estimated dry matter per pound of steer gain and the carrying capacity in steers per acre for the seasons 1935-38.

TABLE 9.—*Steer gains and herbage yields¹ per acre, estimated dry matter required per pound of steer gain, and the average carrying capacity in steers per acre for each pasture*

1935—2. TO 3-YEAR-OLD STEERS

Pasture	Apr. 3-May 1		May 1-May 20		May 20-June 26		June 26-July 24		July 24-Aug. 21		Aug. 21-Sept. 18		Sept. 18-Oct. 16 ²		Total for season		Estimated dry matter required per pound of steer gain		Average carrying capacity (steers per acre)
	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	
1	123.3	1,547	23.3	1,166	26.6	629	28.3	552	21.6	637	46.6	948	5.3	1,726	27.5	7,515	27.33	0.81	
2	143.3	1,811	38.3	1,057	51.7	727	38.3	921	12.5	585	55.0	1,111	7.2	3,006	32.4	10,565	32.61	.93	
3	147.0	1,808	65.5	51.7	38.3	921	33.3	138	15.0	955	55.0	1,026	11.2	2,243	35.2	9,542	27.11	.96	
4	180.5	1,655	48.3	296	28.3	1,737	55.0	618	33.3	2,213	48.3	746	3.8	1,947	39.8	10,212	25.66	1.27	
5	139.8	1,661	36.7	1,503	46.7	(3)	38.3	461	21.7	1,682	38.3	1,277	25.0	1,277	34.7	8,363	24.10	1.05	
6	190.2	1,906	71.7	1,219	45.0	2,067	28.3	525	25.0	1,543	48.3	2,268	-4.0	1,288	40.6	10,846	26.78	1.33	
7	39.5	13.3	28.3	1,574	50.0	1,574	26.7	11.7	10.0	1,295	30.0	50.0	18.3	1,295	16.8	3,500	16.88	.67	
8	166.8	2,036	33.3	1,969	20.0	635	10.0	—	—	—	—	—	—	—	—	—	—	1.11	
9	44.5	—	18.3	—	11.7	—	31.7	—	5.0	—	41.7	—	13.3	—	—	—	—	.85	

1936—2. TO 3-YEAR-OLD STEERS

	Apr. 15-May 13		May 13-June 10		June 10-July 8		July 8-Aug. 5		Aug. 5-Sep. 2		Sept. 2-Sept. 30		Sept. 30-Oct. 14 ²		Oct. 14 ² -Nov. 1		Nov. 1-Dec. 15	
	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield
1	68.7	1,021	35.0	1,364	47.5	563	29.2	930	37.9	854	30.3	887	17.2	2,788	26.6	8,397	31.57	0.78
2	91.3	1,027	50.0	1,364	47.5	658	33.3	1,287	22.5	743	31.3	588	34.3	2,717	31.0	8,384	27.65	1.00
3	107.8	1,335	55.8	1,601	50.0	500	27.5	990	41.7	719	39.7	1,149	16.7	2,935	33.9	9,238	27.25	1.00
4	98.7	1,421	46.7	1,571	50.8	974	20.8	1,110	1,110	1,513	36.8	593	26.3	2,630	31.1	9,812	31.55	1.17
5	92.2	1,292	38.3	1,448	45.0	526	39.2	865	34.6	904	40.3	1,139	26.3	2,755	31.6	8,929	28.26	1.00
6	120.0	1,563	70.8	1,625	45.8	310	1,488	30.0	1,488	1,526	29.3	1,029	35.8	2,867	36.7	10,438	28.44	1.33
7	0	—	0	—	0	—	17.5	—	13.3	—	13.3	—	—	—	—	49	—	.33
8	101.0	1,108	20.8	1,342	50.0	403	9.2	27.5	1,266	19.5	1,287	40.0	—	—	239	9,056	37.89	.78
9	51.5	824	22.5	841	17.5	236	38.8	244	10.4	893	30.0	789	16.0	2,755	187	6,582	35.20	.65

See footnotes at end of table.

TABLE 9.—Steer gains and herbage yields¹ per acre, estimated dry matter required per pound of steer gain, and the average carrying capacity in steers per acre for each pasture—Continued

1937—YEARLING STEERS

Pas-ture	Apr. 8-May 6		May 6-June 3		June 3-July 1		July 1-July 29		July 29-Aug. 26		Aug. 26-Sept. 23		Sept. 23-Oct. 21 ²		Total for season		Estimated dry matter required per pound of steer gain		Average carrying capacity (steers per acre)			
	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Pounds	Pounds	Pounds	Pounds		
1	60.0	912	53.5	100	44.5	199	68.5	339	50.3	1,519	34.0	471	-1.5	1,038	19.5	2,197	19.5	2,197	19.5	2,197	19.5	
2	76.0	771	35.0	-256	44.5	66.0	61.0	-2.1	1,122	50.5	1,026	21.0	-68	3.6	1,814	12.6	1,560	12.6	1,560	12.6	1,560	12.6
3	93.5	1,062	44.5	890	14.1	1,628	36.1	-278	1,100	15.3	1,557	-2.8	1,407	18.3	1,813	-1.5	1,560	-1.5	1,560	-1.5	1,560	-1.5
4	86.5	643	66.0	610	8.5	1,122	50.5	1,026	21.0	-68	3.6	1,814	12.6	1,587	12.6	1,587	12.6	1,587	12.6	1,587	12.6	
5	92.5	936	48.8	264	-14.5	1,375	26.0	1,974	33.0	857	-2.6	1,890	5.1	1,930	-1.6	1,739	-1.6	1,739	-1.6	1,739	-1.6	
6	117.3	863	62.3	726	-14.5	493	50.0	727	36.5	597	1.0	1,435	26.8	1,739	4.5	1,555	26.8	1,555	26.8	1,555	26.8	
7	25.5	1,274	9.6	177	20.5	1,165	20.1	795	1.1	795	1.1	1,228	2.5	1,739	1.1	1,819	1.1	1,819	1.1	1,819	1.1	
8	79.1	879	55.0	305	-10.5	1,628	27.3	1,026	36.6	1,228	2.5	1,739	13.3	1,669	-1.6	203	-1.6	203	-1.6	203	-1.6	
9	65.2	610	49.5	798	-17.0	1,187	42.0	1,042	36.7	1,228	2.5	1,739	11.2	1,549	32.2	2,167	32.2	2,167	32.2	2,167	32.2	

1938—2-YEAR-OLD STEERS

Pas-ture	Mar. 24-Apr. 21		Apr. 21-May 19		May 19-June 16		June 16-July 14		July 14-Aug. 11		Aug. 11-Sept. 8		Sept. 8-Oct. 6		Oct. 6-Nov. 3 ²		Oct. 6-Nov. 3 ²				
	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield	Steer gains	Herbage yield			
1	101.7	-155	43.0	574	37.0	278	12.0	575	28.7	425	38.7	1,075	31.7	370	18.7	392	18.7	392	18.7		
2	100.3	128	28.8	542	28.5	367	24.0	773	15.1	697	31.7	1,377	4.3	431	12.0	213	24.5	213	24.5		
3	123.8	300	33.8	542	40.5	248	26.1	618	19.7	480	24.0	969	29.0	269	16.0	245	33.3	245	33.3		
4	93.0	-204	9.1	468	40.5	242	9.1	607	11.3	158	18.6	538	29.3	928	18.3	-11	236	3.7	236	3.7	
5	157.7	117	7.1	27	52.5	555	9.1	716	41.0	768	45.3	1,182	36.7	686	11.1	179	4.230	11.72	11.72	11.72	
6	123.5	834	45.3	751	70.7	1,154	9.3	670	4.0	577	28.5	664	43.3	664	3.0	112	3.33	112	3.33	112	3.33
7	121.7	275	0	833	46.3	460	19.5	512	43.0	106	10.0	1,342	43.7	-38	17.8	419	3.909	12.94	12.94	12.94	
8	128.7	-161	13.8	322	45.3	447	9.1	376	14.7	643	47.0	1,023	43.0	427	18.8	316	3.393	10.60	1.01	1.01	
9	116.7	-473	30.7	545	51.2	3	17.5	574	14.2	419	40.5	1,035	26.2	545	14.7	-266	3.352	7.54	7.54	7.54	

¹ Herbage yield = oven-dried clippings less oven-dried clippings of same date from a comparable area in the openly grazed pasture. Negative yields (or theoretical losses) indicate more growth on the area in the open (or pasture under grazing) at the time the sample is taken than is under the A cage. Discrepancies are not the result of the difficulty in selecting representative areas, also as a result of the maturity of the protected areas (A cage) when compared with the more succulent growth under continuous grazing.

² On Oct. 16, 1935, Oct. 14, 1936, and Oct. 21, 1937, the pastures were grazed too closely to permit an open-area sampling; therefore, the herbage yield for the periods ending on those dates represents the entire A clipping. On Nov. 3, 1938, samples from the open pasture were obtained, and the herbage yield for the period ending then was calculated as indicated in footnote 1.

³ A cage disturbed by steers.

⁴ As pasture 7 was not considered a part of the experiment during 1935 and 1936, no forage yields were obtained. It was used as a catch pasture, and steers surplus to the needs in other pastures were placed in it, and their gains shown.

⁵ Because of a shortage of cages, no A-cage yields were obtained in pasture 9 in 1935.

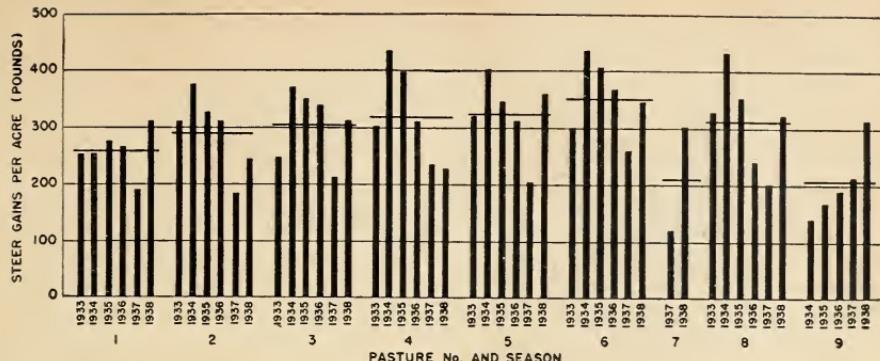


FIGURE 7.—Steer gains in pounds per acre for each pasture for the years 1933–38. The horizontal line represents the 6-year average.

A study of the steer gains per acre for the years 1933–38, inclusive (table 10), shows that for all pastures the gains the second year (1934) were greater than the 1933 gains. In six of the pastures the 1934 gains (see fig. 7) were the greatest of any year of the experiment.

The average steer gains and the net value of the gains are also given in table 10. It will be noted that, with the exception of pasture 9 (which received basic slag), there is not a great difference in the production of the pastures receiving lime; also that the cost of fertilizers directly affected the net value of the steer gains of each pasture. Because of the low cost of lime alone the net values of the gains on pastures 5 and 8 are the highest. Pasture 6, with the greatest total fertilizer cost, had the lowest net value.

TABLE 10.—Average steer gain per acre for each pasture for the years 1933–38, inclusive, its gross value at 5 cents per pound, and the average cost of lime and fertilizer per acre

Pasture	1933	1934	1935	1936	1937	1938	Steer gain		Average cost of lime and fertilizer per acre	Net value of steer gain ¹
							Average per acre	Gross value at 5 cents per pound		
1	252	254	275	266	192	312	259	12.95	1.57	11.38
2	311	377	324	310	186	245	292	14.60	2.60	12.00
3	249	370	352	339	214	313	306	15.30	4.16	11.14
4	304	434	398	311	238	229	319	15.95	8.05	7.90
5	323	403	347	316	208	361	326	16.30	1.03	15.27
6	299	433	405	367	259	343	351	17.55	9.70	7.85
7	0	0	0	0	117	302	210	10.50	.90	9.60
8	327	430	350	239	203	320	312	15.60	1.03	14.57
9	0	137	166	187	220	312	204	10.20	.36	9.84

¹ Only lime and fertilizer expense has been deducted from gross value of gains. Other production expense items, such as labor, seed, interest, taxes, etc., have not been taken into consideration.

With the exception of pastures 1 and 9, a decided 3-year downward trend is shown in steer gains per acre after the peak gains of 1934. In contrast with this, the 1938 gains, with the exception of pasture 4, were significantly greater than the 1937 gains. Of the nine pastures, the steer gains of pasture 1 were the most uniform over the 6-year period. In contrast with the fluctuating yearly gains of

pastures 1 to 8 (excluding 7 with only the 2-years' observations), pasture 9 shows a steady yearly increase in steer gains per acre.

The 6-year average steer gains (see table 10) per acre for each pasture show a steady increase from pasture 1 (259 pounds) to pasture 6 (351 pounds). With pasture 8 (312 pounds) and pasture 9 (204 pounds), the 6-year average decreases.

SUMMARY AND CONCLUSIONS

The influence of the different fertilizer treatments became less pronounced as the experiment progressed. This was evidenced by the fact that after 8 years the general flora was quite uniform. Likewise, the steer gains varied less between pastures in 1938 than in previous years (see pastures 1, 3, 5, 6, and 8). Pasture 9, which received one application of basic slag in 1932, showed a decided improvement in both the flora and the steer gains.

There was a close relationship between the average steer gains and the forage yields per acre for each pasture (see fig. 5).

Even though the steer gains of pasture 6 were greater than those for any other pasture, their net value (based at 5 cents per pound) after the total cost of the fertilizer was deducted, was less than that of the steer gain for any other pasture.

Pastures 5 and 8, receiving lime alone, returned the greatest net value, averaging \$14.92 per acre.

Good pastures can be produced and maintained on Gulf coast soils through the use of (1) white clover, hop clover, Bermuda grass, and Dallis grass as basic crops, (2) adequate fertilizers, and (3) good management practices, including periodic mowing and controlled grazing.

